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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/632,948

08/01/2003

James M. Tour

11321-P022WUD2

4978

47744

7590

10/20/2006

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EXAMINER

SUCH, MATTHEW W

ART UNIT

PAPER NUMBER

2891

DATE MAILED: 10/20/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/632,948	Applicant(s) TOUR ET AL.	
	Examiner Matthew W. Such	Art Unit 2891	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 31 August 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 69-78,85-87,94-96 and 130-135 is/are pending in the application.
- 4a) Of the above claim(s) 74-78,94-96 and 133-135 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 69-73,85-87 and 130-132 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 1 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☒ Certified copies of the priority documents have been received in Application No. 10/470,517.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>2 March 2004</u> .  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election without traverse of Group I, drawn to claims 69-73, 85-87, and 130-132, in the reply filed on 31 August 2006 is acknowledged.

### ***Specification***

2. The disclosure is objected to because of the following informalities:
  - i. The word "fortoy" on Page 13, Line 14 should read "forty";
  - ii. The word "visable" on Page 17, Line 18 should read "visible";
  - iii. The word "contaning" on Page 19, Line 35 should read "containing".

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 69-72, 130 and 132 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuekes ('214) in view of Kanayama ('617).

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5. Regarding claims 69-71 and 132, Kuekes teaches a process of covalently attaching a molecular wire or molecular switch (Element Rs; Figs. 1a-1b, 8a-8c) to a derivatized fullerene, such as a carbon nanotube (Col. 3, Lines 37-40; Col. 4, Line 64). Kuekes does not teach that the carbon nanotube can be derivatized with a diazonium species.

Kanayama teaches derivatizing fullerenes to covalently attach organic molecules using a diazonium species (Col. 4, Lines 66-67; Col. 5, Lines 1-7). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a diazonium species since the process is highly conventional for those skilled in the art (Kanayama Col. 4, Lines 66-67). Furthermore, the resulting alkyl fullerene has excellent thermal stability and increased solubility in various solvents, making additional chemical processing simpler (Col. 5, Lines 1-7).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a single walled carbon nanotube in order to approach the smallest limit of electrical wiring in devices and increase the density of the devices.

6. Regarding claims 72 and 130, Kuekes teaches a molecular electronic device connected to the molecular wire (Element Rs; Fig. 8b-10b).

7. Claims 73 and 131 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuekes ('214) in view of Kanayama ('617) as applied to claims 69 and 71 above, and further in view of Chen (Science).

Kuekes in view of Kanayama does not teach that the molecular wire comprises an oligo (phenylene ethylene) molecule.

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Chen teaches using an oligo (phenylene ethylene) molecule in an electronic device. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use an oligo (phenylene ethylene) molecular wire in the process of Kuekes in view of Kanayama since the oligo (phenylene ethylene) exhibits large reversible switching behavior (Chen, first paragraph, page 1550) for the memory device of Kuekes in view of Kanayama (Kuekes Abstract).

8. Claims 85-87 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuekes ('214) in view of Kanayama ('617) in view of Rueckes (Science).

Kuekes teaches forming an assembly with a first plurality of carbon nanotubes (Elements 1-6 in Figures) and a second plurality of carbon nanotubes (Elements a-f in Figures) which can be individually addressed electrically (Col. 3, Lines 37-40; Col. 4, Line 64; Col. 7, Lines 1-3). Functionalized molecular wires and molecular switches are connected to the assembly (Element Rs; Figs. 1a-1b, 8a-8c).

Kuekes teaches immersing the assembly in a chemical species (Col. 9, Lines 35-55). Furthermore, Kuekes teaches that the assembly is reacted electrochemically with the chemical species (Col. 5, Lines 59-67; Col. 6, Lines 1-10; Col. 7, Lines 3-14; Col. 10, Lines 42-59). Kuekes does not explicitly teach that the chemical species can be a diazonium species.

Kanayama teaches derivatizing fullerenes to covalently attach organic molecules using a diazonium species (Col. 4, Lines 66-67; Col. 5, Lines 1-7). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a diazonium species in the chemical species since the process is highly conventional for those skilled in the art (Kanayama

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Col. 4, Lines 66-67). Furthermore, the resulting alkyl fullerene has excellent thermal stability and increased solubility in various solvents, making additional chemical processing simpler (Col. 5, Lines 1-7).

Kuekes teaches that a negative potential is applied to the assembly (Col. 10, Lines 42-59). However, Kuekes does not teach that applying this negative potential will cause the first plurality to essentially come in contact with the second plurality.

Rueckes teaches a first plurality of carbon nanotubes and a second plurality of carbon nanotubes in an assembly used as a memory device in molecular computing (Fig. 1; Abstract). Furthermore, when a potential is applied across the carbon nanotubes, the first and second pluralities essentially come in contact with each other due to the electrostatic potential between the nanotubes (See Page 96, middle column; Fig. 2B). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the first and second plurality come into contact in order to produce a strong bistable effect in the memory device (Page 95, right column; Abstract).

### *Conclusion*

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- a. Yamamoto ('076), Ruoff ('748), and Murphy ('412) teach conventional methods of reacting diazonium species with fullerenes;
- b. Wong (Nature) teaches a method to covalently attach organic functional molecules to carbon nanotubes;

- c. Tour ('511) & Ellenbogen ('700) each teach configurations for molecular devices.

***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew W. Such whose telephone number is 571-272-8895. The examiner can normally be reached on Monday - Friday 8AM-5PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bradley W. Baumeister can be reached on 571-272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Matthew W. Such  
Examiner  
Art Unit 2891

MWS  
10/12/06

  
**B. WILLIAM BAUMEISTER  
SUPERVISORY PATENT EXAMINER**